ECE440: Homework #3

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1. Problem P5, Chapter 3

The receiver cannot be certain that no bit errors have occurred because of how the checksum is calculated. Checksums add two 16-bit strings together. If, for example, there is a bit flip in each of these strings, then the sum could still match but the data would be incorrect.

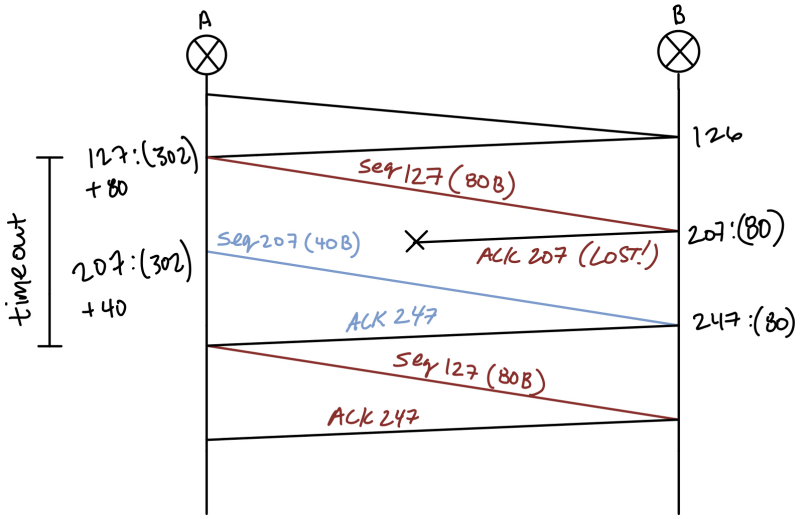
2. Problem P27, Chapter 3

(a) seq # = 207, source port = 302, destination port = 80

(b) ACK # = 207, source port = 80, destination port = 302

(c) ACK # =127 because Host B indicates that it hasn't received 127 yet.

(d) Timing Diagram



3. Problem 3

(a) Congestion Window = 16KB, no packet loss (slow-start state)

	Initial	1RTT	2RTT	3RTT	4RTT
`cwnd`	1KB	2KB	4KB	8KB	16KB

$4RTT = 4 \times 100ms =$ 400ms

(b) Timeout at 16KB, no packet loss (congestion-avoidance state**)

$\texttt{ssthresh} = \frac{\texttt{cwnd}}{2} = \frac{16KB}{2} = 8\text{KB}$ and $\texttt{cwnd} = 1$

	Initial	1RTT	2RTT	3RTT	4RTT	5RTT	6RTT	7RTT	8RTT	9RTT
`cwnd`	1KB	2KB	4KB	8KB**	9KB	10KB	11KB	12KB	13KB	14KB

$9RTT = 9 \times 100ms = \boxed{900\text{ms}}$

(c) Quadruple duplicate ACK event (fast-recovery state)

$\texttt{ssthresh} = \frac{\texttt{cwnd}}{2} = \frac{14KB}{2} = 7\text{KB}$ and

$\texttt{cwnd} = \frac{\texttt{ssthresh}}{2} + \#\ Duplicates = 3 + 4 = 7\text{KB}$

	Initial	1RTT	2RTT
`cwnd`	7KB	8KB	9KB

$2RTT = 2 \times 100ms = \boxed{200\text{ms}}$